

WHAT IS CLAIMED IS:

1. A scalable distributed multimedia streaming system comprising:
at least one media station having a media director and a plurality of media engines, each media engine having

5 means for storing media content,
 means for retrieving media content over the network and
 means for streaming media content over the network,
the media director having
 means for directing retrieval over the network of media content by a
10 selected media engine,
 means for tracking content stored on the media engines and
 means for redirecting a content request from a media console connected to
the at least one media station to a selected one of the media engines storing
content corresponding to the request for streaming;
15 a media location registry communicating with the media director in each
media station, the media location registry storing the location of all media content
in the media stations, and
 means for downloading content to be presented.

2. A scalable distributed multimedia streaming system as defined in claim 1 wherein
20 the means for downloading content comprises:

a content manager for providing program information to the media stations;
a content engine for downloading content from selected providers; and
a home media station for storing all content downloaded by the content engine.

3. A scalable distributed multimedia streaming system as defined in claim 1 wherein
25 the means for storing content incorporates multiple independent I/O channels for
simultaneous input and output.

5. A scalable distributed multimedia streaming system as defined in claim 1 further comprising an authentication server communicating through the network for distribution of tokens to the media console.

6. A scalable distributed multimedia streaming system as defined in claim 1 wherein
5 the media station comprises a chassis having a plurality of blades, a first blade functioning as the media director and a plurality of blades functioning as media engines.

7. A scalable distributed multimedia streaming system as defined in claim 6 wherein
each blade has direct communication with a network through a communications agent
and the system further comprises a network management system for all components in
10 the system.

8. A scalable distributed multimedia streaming system as defined in claim 6 wherein
each blade includes a chassis blade controller for communication through the chassis
backplane in the media station and a main board for media engine and media director
functions.

15 9. A scalable distributed multimedia streaming system as defined in claim 2 further comprising a plurality of media stations.

10. A method for scalable distributed multimedia streaming comprising the steps of:
providing a communications network;
connecting at least one media station to the network having a media director and a
20 plurality of media engines;
providing a media location registry;
downloading content to be presented;
communicating from the media location registry to a media director in each media
station the content to be distributed;
25 directing through media director in the media station independent retrieval over
the network of media content by at least one selected media engine;
storing the media content on the selected media engine;
tracking content stored on the media engines in the media director;

storing the location of all media content in the media station in the media location registry;

redirecting a content request from a media console connected to the media station through the network to a selected one of the media engines storing content corresponding to the request for streaming;

streaming media content over the network from the selected media engine to the media console.

11. A method as defined in claim 10 employing a plurality of media stations wherein the step of downloading content comprises the steps of:

transferring metadata of a program to a content manager;
instructing a content engine to transfer the program data into a Home Media Station;

updating the state of the program to “inactive” and specifying a publish time to the content manager;

sending distribution parameters to the media location register;
distributing the program;
sending a “publish” command to the media station at the publish time to start the service of the program.

12. A method as defined in claim 11 wherein distributing the program comprises the steps of:

directing the media director in a seeking media station to obtain the program including identifying a source media station where the content is present;

requesting from the media director of the source media station the location of the needed segment;

notifying the seeking media director of the location of the segment in selected media engine;

directing by the seeking media director a receiving media engine in the seeking media station to fetch the segment from the selected media engine;

requesting a copy of the segment from the selected media engine;
transferring the segment from the selected media engine to the receiving media engine;
notifying the seeking media director that the copying of the segment is complete;
5 and,
notifying the media location register of the new location of the segment for addition to the location database.

13. A method as defined in claim 12 wherein the source media station is the home media station.

10 14. A method as defined in claim 11 wherein content requested by the media console is not present on the media station and comprising the steps of:

receiving a streaming request through the media director;
querying the media location registry for the location of the program or segment requested;

15 responding from the media location registry with locations for the segment;
selecting a source media station by the media director;
requesting the location of the segment from a media director in the source media station;

responding with the address of a source media engine having the segment;
20 directing a selected target media engine to fetch the segment;
requesting by target media engine a copy of the segment from source media engine;

sending the segment to the target media engine;
notifying the media director of completion of the copy and
25 notifying the media location register of the new location of the segment.

15. A method as defined in claim 14 wherein the step of selecting a source media station further comprises the steps of:

identifying multiple locations may exist where the desired segment is stored;

calculating the relative cost of obtaining the desired copy of the segment based on a number of parameters including the bandwidth available, distance from the source media station, copying time and load of the source media station.

16. A method as defined in claim 10 wherein the steps of redirecting a content request
5 and streaming media content comprise the steps of:

receiving a request for a first segment by the media director from the media console;

identifying the location of the first segment in a segment location table;

redirecting the media console to the IP address of a first media engine;

10 requesting the first segment from the first media engine;

streaming data from the first media engine;

detecting the segment being streamed as near its end;

requesting the location of the next segment from the Media director;

locating the next segment in the segment location table;

15 replying with the identification of the next segment and the IP address of a second media engine where the next segment resides;

notifying the second media engine to preload the next segment;

upon completion of the streaming of the first segment, directing the second media engine to start streaming the next segment to the IP address of the media console;

20 streaming the data of the next segment from the second media engine to the media console;

upon assumption of the communication of the stream with the Media console by the second media station, notifying the media director.

17. A method as defined in claim 16 wherein the steps of detecting the segment being
25 near its end through notifying the media director are repeated until the media console orders a cessation of streaming by the media engine at which time the media engine notifies the media director that the streaming has stopped.

18. A method as defined in claim 16 wherein the segment location table identifies a plurality of media engines in which the segment is stored and in which the step of identifying the location includes the step of selecting a media engine based on load and status.

5 19. A method as defined in claim 16 wherein the first media engine has reached a predetermined maximum capacity when a second media console requests streaming of the same segment further comprising the steps of:

directing a third media engine to fetch the segment, specifying a fourth media engine from which the segment is to be replicated;

10 requesting a copy by the third media engine of the segment from the fourth media engine;

sending the segment from the fourth media engine;

replying to the second media console redirecting to the IP address of the third media engine;

15 requesting by the second media console of playing of the stream; and,

responding by the third media engine forwarding data for the segment to the second media console.

20. A method as defined in claim 19 further comprising the steps of:

20 sending a copy done from the third media engine to the MD when copying of the segment from the fourth media engine to the second media engine is complete; and,

notifying the MLR of the new location for the segment.

21. A method as defined in claim 16 wherein the media director has directed the first media engine to fetch the first segment and wherein the step of redirecting occurs during receipt of the segment and the step of streaming data from the first media engine further
25 comprising the steps of:

receiving a fast forward request of the stream from the media console;

identifying the potential for a streaming error if the fast forward exceeds the portion of the segment which has been received by the media engine;

notifying the media director of the impending error state;
replying to the media engine with the identification of a third media engine
having the entire segment;
requesting of the third media engine a swap identifying the media console in
5 current communication; and,
streaming of data by the third media engine from the segment to media console.

22. A method as defined in claim 21 wherein the third media engine has also been
streaming further comprising the steps of;

returning from the third media engine a swap identifying a second media console
10 in communication; and,
streaming of data by the first media engine to the second media console.

23. A method as defined in claim 10 further comprising prior to the step of redirecting
the steps of:

requesting by the media console of a security token from a security authentication
15 server on the network;

confirmation of subscriber authentication for the media console; and,
issuing the security token based on the subscriber authentication;

and the step of redirecting further includes the steps of:

receiving the security token from the media console;
20 confirming the security token with respect to the streaming request.

24. A method as defined in claim 12 further comprising the steps of:

authenticating each media engine by an authentication server;
supplying a second security token to each authenticated media engine;

and wherein the step of requesting a copy of the segment includes

25 receiving the second security token from the receiving media engine.

25. A method as defined in claim 14 further comprising the steps of:

authenticating each media engine by an authentication server;
supplying a second security token to each authenticated media engine;

and wherein the step of requesting a copy of the segment includes
receiving the second security token from the target media engine.